

## CLAIMS

What is claimed is:

1. A method of displaying physiological patient data from a cyclic physiological waveform, the patient data including a plurality of data points, each data point representing the amplitude of the physiological patient data, the method comprising the acts of:

acquiring the physiological patient data; and  
displaying the physiological patient data in a three dimensional representation.

2. A method as set forth in claim 1, wherein the physiological data is electrocardiogram data.

10 3. A method as set forth in claim 1, wherein the physiological data is blood pressure data.

4. A method as set forth in claim 1, wherein the physiological data is cardiac output data.

15 5. A method as set forth in claim 1, wherein the physiological data is pulse oximetry data.

6. A method as set forth in claim 1, and further comprising the acts of storing the physiological patient data in a memory array.

7. A method as set forth in claim 6, wherein the memory array is a waveform array.

20 8. A method as set forth in claim 1, and further comprising the acts of parsing the physiological patient data into a series of waveforms.

9. A method as set forth in claim 8, wherein the series of waveforms are median waveforms.

10. A method as set forth in claim 8, wherein the act of displaying includes the act of plotting the parsed waveforms in a temporal alignment to allow detection of long term trends in physiological data.

5 11. A method as set forth in claim 1, wherein the act of displaying further includes the act of assigning a representative X coordinate, Y coordinate, and Z coordinate, to each data point and plotting each data point on the display to produce a three dimensional representation.

10 12. A method as set forth in claim 1, further including the act of parsing the data points into a series of median waveforms and wherein the act of displaying further includes the act of plotting the waveforms in a temporal alignment.

13. A method as set forth in claim 1, wherein the act of displaying further includes the act of color-coding the amplitude values of the data points in the relevant range.

15 14. A method as set forth in claim 13, wherein the relevant range is +0.5mV to 0.5mV.

15. A method of displaying physiological patient data from a cyclic physiological waveform, the method comprising:

acquiring the physiological patient data;

storing the physiological patient data in a memory array; and

20 displaying the physiological patient data in a three dimensional representation, the act of displaying including parsing the physiological patient data into a series of waveforms such that each successive waveform is plotted in a temporal alignment to allow detection of long term trends in physiological data, the act of parsing each waveform into a series of successive data points such that each data point has a coordinate that is plotted on the display to produce a three dimensional representation, each successive data point having a discrete amplitude, and assigning a color according to the amplitude of the data point if the amplitude is within the relevant range.

16. A method as set forth in claim 15, wherein said physiological patient data is electrocardiogram data.

17. A method as set forth in claim 15, wherein the physiological data is blood pressure data.

5 18. A method as set forth in claim 15, wherein the physiological data is cardiac output data.

19. A method as set forth in claim 15, wherein the physiological data is pulse oximetry data.

10 20. A method as set forth in claim 15, wherein the memory array is a waveform array.

21. A method as set forth in claim 15, wherein the series of waveforms are median waveforms.

22. A method as set forth in claim 15, wherein the relevant range is +0.5mV to -0.5mV.

15 23. An apparatus for displaying physiological patient data from a cyclic physiological waveform, the data including a plurality of data points having an amplitude representing the value of the physiological parameter, the apparatus comprising:

a display; and

20 a processor for producing a three dimensional representation of the physiological patient data.

24. An apparatus as set forth in claim 23, and further comprising a patient monitor device as the source of physiological patient data.

25. An apparatus as set forth in claim 24, wherein the patient monitor device includes a transducer for acquiring the physiological patient data from a patient.

5 26. An apparatus as set forth in claim 24, wherein the patient monitoring device is a Holter monitor.

27. An apparatus as set forth in claim 24, wherein the patient monitoring device is a stress-testing monitor.

10 28. An apparatus as set forth in claim 23, and further comprising a memory device connected to the processor.

29. An apparatus as set forth in claim 28, wherein the physiological patient data is stored as a memory array.

15 30. An apparatus as set forth in claim 29, wherein the memory array is a waveform array.

31. An apparatus as set forth in claim 23, wherein the display is a black and white display capable of displaying/generating shades of gray in between black and white.

32. An apparatus as set forth in claim 23, wherein the display is a red-blue-green color display.

20 33. An apparatus as set forth in claim 23, wherein the display has a plurality of pixels for displaying the respective coordinates.

34. An apparatus as set forth in claim 23, wherein the processor further comprises software for animation and walk through of three-dimensional representations.

25 35. An apparatus as set forth in claim 23, wherein the processor further comprises software for receive physiological data.

36. An apparatus as set forth in claim 23, wherein the processor further comprises software to parse the physiological data.

37. An apparatus as set forth in claim 36, where in the physiological data is parsed into a series of waveforms.

5 38. An apparatus as set forth in claim 37, wherein the series of waveforms are median waveforms.

39. An apparatus as set forth in claim 23, wherein the processor further comprises software to generate a waveform display on the display.

10 40. An apparatus as set forth in claim 39, wherein the waveform display places the data points at respective pixels on the display.

~~Sub A~~ 41. A software program for generating a display of physiological data from a cyclic physiological waveform, the software program comprising:

- (a) a program module for acquiring the physiological patient data;
- (b) a program module for storing the physiological patient data in a memory array;
- (c) a program module for displaying a three dimensional representation;
- (d) a program module for setting the current waveform to the first waveform in the waveform array;
- (e) a program module for providing a Z coordinate counter and initializing the Z coordinate counter to zero;
- (f) a program module for providing a X coordinate counter and initializing the X coordinate counter to zero;
- (g) a program module for providing a Y coordinate counter and initializing the Y coordinate counter to zero;
- (h) a program module for providing a determining the pixel color based on the Y coordinate of the data point;
- (i) a program module for plotting the current data point of the current waveform at the current coordinate in the color determined in (h);

(j) a program module for incrementing the X coordinate counter and repeating (h) and (i) until all data points in the current waveform are plotted; and

5 (k) a program module for incrementing the Z coordinate counter and repeating (h)-(j) until all waveforms in the waveform array are plotted.

42. An apparatus for displaying physiological patient data from a cyclic physiological waveform, the data including a plurality of data points having an amplitude representing the value of the physiological parameter, said apparatus comprising:

10 a display;

a means for producing a three dimensional representation of the physiological patient data.

43. An apparatus as set forth in claim 42, and further comprising a patient monitor device as a source of physiological patient data.

15 44. An apparatus as set forth in claim 43, wherein the patient monitor device includes a transducer for acquiring the physiological patient data from a patient.

45. An apparatus as set forth in claim 43, wherein the patient monitor device is a Holter monitor.

20 46. An apparatus as set forth in claim 43, wherein the patient monitor device is a stress-testing monitor.

47. An apparatus as set forth in claim 42, wherein the means for producing a three dimensional representation includes storing the physiological data.

25 48. An apparatus as set forth in claim 47, wherein the physiological patient data is stored in a memory array.

49. An apparatus as set forth in claim 48, wherein the memory array is a waveform array.

50. An apparatus as set forth in claim 42, wherein the display is a black and white display capable of displaying/generating shades of gray in between black and white.

5 51. An apparatus as set forth in claim 42 wherein the display is a red-blue-green color display.

52. An apparatus as set forth in claim 42, wherein the display has a plurality of pixels for displaying the respective coordinates.

10 53. An apparatus as set forth in claim 42, wherein the means for producing a three dimensional representation includes animating the three dimensional representation for analysis of the three dimensional representation.

54. An apparatus as set forth in claim 42, wherein the means for producing a three dimensional representation includes receiving physiological data.

55. An apparatus as set forth in claim 42, wherein the means for producing a three dimensional representation includes parsing the physiological data.

15 56. An apparatus as set forth in claim 55, where in the physiological data is parsed into a series of waveforms.

57. An apparatus as set forth in claim 56, wherein the series of waveforms are median waveforms.

20 58. An apparatus as set forth in claim 42, wherein the means for producing a three dimensional representation includes generating a waveform display on the display.

59. An apparatus as set forth in claim 58, wherein the waveform display places the data points at respective pixels on the display.